

## ASSIGNMENT 5

Textbook Assignment: "Sewage Treatment and Disposal," "Compressed Air Systems," and "Boilers."  
Pages 10-32 through 12-14.

---

- 5-1. What type of wastewater system eliminates the need for septic tanks, cesspools, or leaching fields?
1. Holding ponds
  2. Polishing ponds
  3. Common sewers
  4. Storm sewers
- 5-2. What is the minimum desirable size of a septic tank?
1. 500 gallons
  2. 1,000 gallons
  3. 1,250 gallons
  4. 2,000 gallons
- 5-3. When a septic tank discharges into a leaching field greater than 500 feet in length, you should incorporate what component(s) into the system ?
1. Dosing tank only
  2. Siphon only
  3. Dosing tank and siphon
  4. Inlet and outlet filters
- 5-4. Regardless of size, a septic tank should be inspected at what standard intervals?
1. 6 months
  2. 2 months
  3. 12 months
  4. 18 months
- 5-5. At what minimum distance from a septic tank should a (a) shallow well and (b) deep well be located?
1. (a) 200 feet (b) 50 feet
  2. (a) 200 feet (b) 75 feet
  3. (a) 100 feet (b) 50 feet
  4. (a) 100 feet (b) 75 feet
- 5-6. Leaching cesspools should be located what minimum distance from each other?
1. 10 feet
  2. 20 feet
  3. 30 feet
  4. 40 feet
- 5-7. Perforated pipe of what size should be used in leaching fields?
1. 10-inch diameter
  2. 8-inch diameter
  3. 6-inch diameter
  4. 4-inch diameter
- 5-8. What is the maximum allowable length of a leaching field lateral?
1. 50 feet
  2. 75 feet
  3. 100 feet
  4. 125 feet
- 5-9. When a leaching field becomes inoperable, you must consider what option?
1. Chemical cleaning
  2. System replacement
  3. Adding additional piping
  4. Pumping the septic tank
- 5-10. Low-pressure systems provide compressed air at a maximum of how many pounds per square inch gauge (psig)?
1. 25
  2. 75
  3. 100
  4. 125
- 5-11. Medium-pressure systems provide compressed air from 126 psig to what maximum pressure?
1. 299 psig
  2. 325 psig
  3. 399 psig
  4. 425 psig

- 5-12. High-pressure systems provide compressed air within what pressure range?
1. 400 psig to 4,000 psig
  2. 400 psig to 6,000 psig
  3. 425 psig to 4,000 psig
  4. 425 psig to 6,000 psig
- 5-13. What type of shop or laboratory requires up to 6,000 psig of compressed air?
1. Torpedo workshop
  2. Testing laboratory
  3. Wind tunnel
  4. Ammunition depot
- 5-14. Air compressor filter systems should be able to remove particles in what micron size range?
1. 1 to 3
  2. 2 to 5
  3. 3 to 7
  4. 4 to 9
- 5-15. Of the following grades of commercial compressed air, which one is the most pure?
1. B
  2. D
  3. F
  4. H
- 5-16. A refrigerant dryer with a dew point at what maximum temperature should be used to remove moisture to meet air quality requirements for instrument and control air?
1. 20°F
  2. 30°F
  3. 35°F
  4. 40°F
- 5-17. With pressure in excess of 400 psig, oil causes what compression phenomenon to occur?
1. Burnout
  2. Blowout
  3. Combustion
  4. Recycling
- 5-18. In a reciprocating compressor, what are the three compression cycle phases?
1. Intake, multistage pressurization, discharge
  2. Intake, impeller rotation, compression
  3. Intake, single-stage pressurization, discharge
  4. Intake, compression, discharge
- 5-19. In a W-type compressor, there are a total of how many cylinders in the (a) first and (b) second stages?
1. (a) One (b) one
  2. (a) Two (b) two
  3. (a) Two (b) one
  4. (a) One (b) two
- 5-20. What type of compressor has two mating rotating screws, one locked and one grooved, to provide the driving force?
1. Rotary
  2. Reciprocating
  3. Helical
  4. Centrifugal
- 5-21. When the load is reasonably constant, what type of compressor is intended for near-continuous industrial air service?
1. Rotary
  2. Reciprocating
  3. Helical
  4. Centrifugal
- 5-22. When placed through a parapet roof, you should extend air intakes what approximate distance above the roof?
1. 6 to 8 feet
  2. 8 to 10 feet
  3. 10 to 12 feet
  4. 12 to 14 feet
- 5-23. Of the following types of intake filters, which one(s) is/are best suited for use in locations where dust is prevalent in the atmosphere?
1. Oil bath only
  2. Viscous impingement only
  3. Oil bath and viscous impingement
  4. Oil injected and centrifugal lubricated

- 5-24. The intercooler in a multistage compressor serves what purpose?
1. To lower the temperature of discharged air
  2. To remove condensation and impurities from the air flow
  3. To reduce the temperature of compressed air between each stage
  4. To add cool air at the beginning of each cycle
- 5-25. Aftercoolers are used in compressor discharge lines for which of the following reasons?
1. To permit the use of larger discharge pipes
  2. To lower the air discharge temperature only
  3. To facilitate condensation and removal of moisture only
  4. To lower the air discharge temperature and facilitate condensation and removal of moisture
- 5-26. Separators are used in conjunction with aftercoolers for what purpose?
1. To remove water and oil from the compressed air
  2. To reduce working pressure in the distribution lines
  3. To separate noncondensable gases from the compressed air
  4. Each of the above
- 5-27. Compressor cylinder oil should have what minimum flash-point temperature?
1. 325°F
  2. 350°F
  3. 375°F
  4. 400°F
- 5-28. Pulsation dampeners serve as pulsation and noise mufflers due to what feature within the dampener?
1. An injector
  2. A vibration amplifier
  3. An acoustical chamber
  4. A sound resonator

- 5-29. The inlet valve unloading device functions mechanically to remove compression loads from the prime mover by
1. disengaging the drive clutch
  2. holding the inlet valve open during the suction and compression strokes
  3. opening the cylinder relief valve
  4. holding the inlet valve closed during the compression stroke

IN ANSWERING QUESTIONS 5-30 AND 5-31, REFER TO FIGURE 11-22.

- 5-30. When the receiver pressure has dropped from 100 psi to 94 psi, U(2) causes the compressor to operate at what percentage of its total output capacity?
1. 25%
  2. 50%
  3. 75%
  4. 100%
- 5-31. When the compressor is operating at 25 percent of capacity, the inlet unloader valves should be in what position?
1. U(4) energized; U(1), U(2), and U(3) de-energized
  2. Each unloader valve energized
  3. U(4) de-energized; U(1), U(2), and U(3) energized
  4. Each unloader valve de-energized
- 5-32. The volume of air that can be released from a compressor cylinder into one clearance pocket is equal to what percentage of the cylinder volume?
1. 25%
  2. 50%
  3. 75%
  4. 100%
- 5-33. When sizing a prime mover, you should take which of the following factors into consideration?
1. Availability of a dc power source
  2. Availability of unleaded fuel
  3. Compressor size in rpm
  4. Belt or drive losses of power

- 5-34. Belt selection for a large motor should be based on what ideal percentage of motor size?
1. 100%
  2. 125%
  3. 150%
  4. 175%
- 5-35. What type of air distribution system is used for isolated service or in situations where special requirements dictate a single path?
1. Parallel
  2. Loop
  3. Radial, one way
  4. Radial, two way
- 5-36. What type of closed-route air distribution system can be used throughout a building?
1. Parallel
  2. Loop
  3. Radial, one way
  4. Radial, two way
- 5-37. Normally, a compressed air distribution system is sized by calculating what factor?
1. Friction loss
  2. Pipe size
  3. Compressor size
  4. Oil loss
- 5-38. In situations where compressed air pipes are pitched upward causing condensate to flow against the flow of air, the minimum pitch of how many inches per hundred feet should be allowed?
1. 10
  2. 2
  3. 6
  4. 4
- 5-39. When testing the system with dry air or nitrogen, you should use what percentage of maximum working pressure for a minimum of 4 hours?
1. 75%
  2. 100%
  3. 125%
  4. 150%
- 5-40. What maintenance program prevents most major prime-mover breakdowns?
1. Manufacturer
  2. Operator
  3. Equipmentman
  4. Construction Mechanic
- 5-41. When a manufacturer's recommended tolerance level between two moving parts is exceeded on a compressor, you must perform which, if any, of the following actions?
1. A component adjustment only
  2. An equipment overhaul only
  3. A component adjustment or an equipment overhaul
  4. None of the above
- 5-42. Air filters should be checked and cleaned a minimum of how often?
1. Daily
  2. Weekly
  3. Monthly
  4. Quarterly
- 5-43. For assistance in air system maintenance and inspection, you should refer to what NAVFAC publication?
1. P-320
  2. P-322
  3. P-324
  4. P-330
- 5-44. When done properly, what is the most important single point in the successful operation of a boiler?
1. Installation
  2. Selection of the site
  3. Accessory procurement
  4. Quality of replacement parts
- 5-45. A boiler should normally be installed in which of the following locations?
1. Close to the galley
  2. Close to the laundry
  3. Near the area of greatest load demand
  4. Near the area of least load demand

5-46. When constructing a boiler foundation you must adhere to what specifications?

1. ASME
2. NAVFAC
3. Manufacturer
4. Organizational

5-47. The main steam stop valve must be a rising spindle type, if the valve is over what size?

1. 1 inch
2. 2 inches
3. 3 inches
4. 4 inches

5-48. What type of valve is located between the main steam stop valve and the guard valve?

1. Relief
2. Daylight
3. Pressure regulating
4. Temperature regulating

IN ANSWERING QUESTIONS 5-49 AND 5-50, REFER TO FIGURE 12-1.

5-49. What accessory is depicted by number 10?

1. Drip leg
2. Root valve
3. PRV
4. TRV

5-50. What accessory is located near number 15?

1. Feed pump
2. Condensate tank
3. Strainer
4. Relief valve

5-51. Refer to foldout figure 12-2. What fitting is depicted by number 8?

1. Gauge glass
2. Glass blowdown
3. Pressure gauge
4. Try cock

5-52. Boilers having a heating surface in excess of 100 square feet must be provided with blowdown piping and fittings in what size range?

1. 1 inch to 2 1/2 inches
2. 1 1/4 inches to 2 1/4 inches
3. 1 1/2 inches to 2 1/2 inches
4. 1 3/4 inches to 2 3/4 inches

5-53. You should manually lift each safety valve to clean it at what intervals?

1. Weekly
2. Biweekly
3. Monthly
4. Quarterly

5-54. Steam piping that is buried or inaccessible requires a drip leg at intervals of not over how many feet?

1. 400
2. 300
3. 200
4. 100

5-55. Normally, a root valve is what type of valve?

1. Butterfly
2. Altitude
3. Globe
4. Gate

5-56. The pressure gauge on a boiler should be tested at what intervals?

1. Annually
2. Semiannually
3. Quarterly
4. Monthly

5-57. As a minimum, high-pressure, HTW, and MUSE boilers require a hydrostatic test at what intervals, in years?

1. 1
2. 2
3. 3
4. 4

- 5-58. When chemically treating a boiler, you should maintain what recommended residual for phosphate?
1. 20 to 40 ppm
  2. 25 to 50 ppm
  3. 30 to 60 ppm
  4. 35 to 70 ppm
- 5-59. Assume the original wall thickness of a tube is 0.225 inch and an exploring block has been cut and examined. What wall thickness requires complete renewal of all tubes from front to rear of the boiler and from center row to outer row, inclusive?
1. 0.110 inch
  2. 0.115 inch
  3. 0.120 inch
  4. 0.125 inch
- 5-60. Under what conditions can a boiler be steamed with tubes that are pitted to a depth of 50 to 65 percent of their wall thickness?
1. When the boiler has been chemically cleaned
  2. When the boiler can withstand a hydrostatic test of 125 percent of design pressure
  3. When future boiler water treatment, use of blowdown, and laying-up procedures conform to NAVFAC requirements
  4. Each of the above
- 5-61. What type of tube defect has scattered pits caused by dissolved oxygen that are relatively short and narrow?
1. Waterside cavities
  2. Waterside grooves
  3. Localized pitting
  4. Corrosion fatigue
- 5-62. At what temperature can waterside burning occur in plain carbon steel tubes?
1. 650°F
  2. 750°F
  3. 900°F
  4. 1000°F
- 5-63. When defects are discovered during waterside inspection of drums and headers or other pressure parts of the boiler, you should take what action?
1. Report the defects to the maintenance officer
  2. Record the defects in the maintenance log
  3. Record the defects in the boiler water treatment log
  4. Each of the above
- 5-64. A hydrostatic test of 125 percent of boiler design pressure is acquired at which of the following times?
1. After renewing downcomers
  2. After rolling superheater support tubes
  3. After renewal of pressure parts
  4. After cleaning firesides
- 5-65. Before cleaning a boiler with an operating pressure of 600 psi, you should hydrostatically test it at what pressure?
1. 150 psi
  2. 600 psi
  3. 750 psi
  4. 900 psi
- 5-66. A hydrostatic test at 150 percent of design pressure is basically what type of test?
1. Tightness of gaskets
  2. Strength of boiler
  3. Tightness of valve seats
  4. Each of the above
- 5-67. After repairs are made to a boiler and before applying a hydrostatic test, you should perform each of the following actions with what exception?
1. Gauging boiler safety valves
  2. Flushing out the boiler with water
  3. Closing all boiler connections and vents
  4. Inspecting the boiler for scale and dirt

5-68. When hydrostatically testing a boiler, you can avoid complications due to temperature changes by

1. continuously operating the main feed pump
2. using water of the same temperature as the boiler and the fireroom
3. using water with temperature below 70°F
4. using hot water from the deaerating feed tank

5-69. A tube seat can be considered tight under which of the following circumstances?

1. It has been rerolled
2. It is bone dry
3. It has been renewed
4. It is only slightly cracked

5-70. The purpose of a 5-year test and inspection is to check what boiler elements?

1. Welds and nozzle connections
2. Handhole and manhole seats
3. Safety valves and welded parts
4. Internal fittings and air vents

## ASSIGNMENT 6

Textbook Assignment: "Boilers." Pages 12-14 through 12-37.

---

- 6-1. Boiler firesides are inspected for signs of damage and deterioration when the boiler is secured for fireside cleaning. At what other intervals should this type of inspection be performed?
1. Each day the boiler is secured
  2. Each time the boiler is secured
  3. When material inspection is inevitable
  4. When NAVFAC requests an inspection
- 6-2. Slag is injurious to refractories chiefly because it results in which of the following problems?
1. Cracking of the refractories
  2. Filling of expansion joints
  3. Peeling off a portion of the refractory surface
  4. Powdering of the refractories
- 6-3. Increasing the temperature of a furnace at an excessively rapid rate is likely to result in what type of problem?
1. Burner cone sag
  2. Anchor bolt shrinkage
  3. Firebrick breakage at the anchor bolts
  4. Deep firebrick fractures
- 6-4. An improperly closed expansion joint has which of the following indications?
1. Excessive slag formation near the joint
  2. A light discolored surface inside the joint
  3. Deep fissures in the firebrick adjacent to the joint
  4. A dark discolored surface inside the joint
- 6-5. A plastic burner front is inspected after its first firing period. Which of the following conditions indicate(s) defective workmanship?
1. Radial cracks only
  2. Parallel cracks only
  3. Radial and parallel cracks
  4. Fallen slabs of plastic from the burner front surface
- 6-6. What are the two most likely causes of failure in a castable burner front surface that has recently been installed?
1. Partial set of the material before installation and too much water in mixing
  2. Too much water in mixing and long storage in a place that is too dry
  3. Too little water in mixing and long storage in a place that is too dry
  4. Partial set of the material before installation and too little water in mixing
- 6-7. What condition(s) contribute(s) to the damage of boiler refractories?
1. Poor boiler operating procedures only
  2. Severe boiler operating conditions only
  3. Poor boiler operating procedures or severe boiler operating conditions
  4. Failure to remove all crumbly material from a castable burner front when installed
- 6-8. Under which, if any, of the following conditions may a boiler be steamed with married tubes?
1. The married tubes are 1 inch in diameter, are located in the main generating bank, and are tight under hydrostatic test
  2. The married tubes are 2 inches in diameter and are located in the fire row
  3. The married tubes are 1 inch in diameter, are located in the main tube bank, and leave a gas passage of 2 inches to the superheater
  4. None of the above



| Tube Defect               | Appearance   | Usual Causes  | Typical Locations  |
|---------------------------|--|---|--|
| Circumferential grooving  | Bands or strips around the circumference           | 1. Tube seat leakage<br>2. Dampened soot deposits on horizontal drums or headers  | 1. Header ends of horizontal tubes<br>2. Vertical generating tubes                                 |
| A                         | Deep, irregular, straight-walled cavities          | 1. Leakage of water entrapped between tube metal and surrounding refractory<br>2. Improper drying of boiler firesides after washing | Header ends of waterwall tubes and division wall tubes that are surrounded by refractory           |
| B                         | Wandering, straight-walled, canyonlike cavities    | 1. Leakage of water entrapped between tube metal and surrounding refractory<br>2. Improper drying of boiler firesides after washing | Header ends of waterwall tubes and division wall tubes that are surrounded by refractory           |
| General fireside thinning | Uniform loss of metal over a relatively large area | G   | 1. Superheater tube ends between headers and seal plates<br>2. Water drum ends of generating tubes |
| C                         | E  | 1. Waterside deposits<br>2. Dry or steam-bound tube   | Anywhere   |
| D                         | F  | Steam jets  | Anywhere   |

Figure 6A

IN ANSWERING QUESTIONS 6-12 THROUGH 6-17, REFER TO FIGURE 6A.

6-9. When a blistered tube suggests a waterside deposit, the nature and extent of this deposit can be determined in what manner?

1. By punching the tube with tube cleaning equipment and inspecting the substance loosened by the wire brush
2. By hitting the blister a sharp blow with a hammer and inspecting the particles knocked loose
3. By removing the tube and an adjacent tube, splitting both, and comparing them
4. By removing the tube, splitting it, and examining the watersides of the blistered tube

6-10. By what means can you measure the amount of enlargement of a tube if calipers are not available to you?

1. A micrometer
2. A section of string and a ruler
3. A depth gauge
4. A straight pin through a 3- by 5-inch card

6-11. What is the most common cause of circumferential grooving on a superheater?

1. Leaking of the economizer plugs
2. Leaking of the tube seats in the top pass of the superheater
3. Soot deposits around the tubes where they enter the headers
4. Water washing the firesides without properly drying them

6-12. What tube defects should be entered in spaces A and B?

1. Craters and water tracks
2. Fireside burning and craters
3. Steam gouging and fireside burning
4. Water tracks and steam gouging

6-13. At what point does cratering and water tracking occur almost exclusively?

1. On the fire row tubes
2. On the tube ends at the water drum
3. At the header ends of the waterwall tubes
4. At the steam end of the waterwall tubes

6-14. What information should be entered in space G?

1. Tube seat leakage
2. Soot or vanadium corrosion
3. Improper drying of boiler firesides after washing
4. Steam jets

6-15. What appearance should be entered in space F?

1. Irregular, smooth-surfaced cavities
2. Coarse, brittle tube metal
3. Uniform loss of metal over a small area
4. Bands around the circumference

6-16. What tube defects should be entered in spaces C and D?

1. Craters and steam gouging
2. Fireside burning and steam gouging
3. Steam gouging and water tracks
4. Water tracks and craters

6-17. What appearance should be entered in space E?

1. Irregular, smooth-surface cavities
2. Coarse, brittle tube metal
3. Uniform loss of metal over a small area
4. Irregular, straight-wall cavities

IN ANSWERING QUESTIONS 6-18 THROUGH 6-21, REFER TO FIGURE 6B.

6-18. What casualties are NOT necessarily caused by overheating?

1. A, C
2. A, E
3. B, D
4. C, E

6-19. What casualty is caused by the most severe overheating?

1. A
2. B
3. D
4. E

6-20. What type of rupture is common in generating tubes?

1. B
2. C
3. D
4. E

6-21. What casualty results from the least severe overheating?

1. B
2. C
3. D
4. E

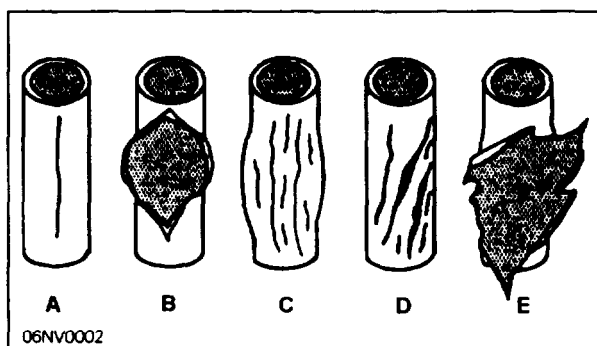


Figure 6B

BOILER TUBE DEFORMITIES

- A. Melting
- B. Warping
- C. Sagging
- D. Cracking

Figure 6C

IN ANSWERING QUESTIONS 6-22 THROUGH 6-25,  
REFER TO FIGURE 6C.

- 6-22. Very mild overheating for a short period of time:
- 1. A
  - 2. B
  - 3. C
  - 4. D
- 6-23. Caused by a mechanical process, such as flexing:
- 1. A
  - 2. B
  - 3. C
  - 4. D
- 6-24. Low water for an extended period of time at high furnace temperatures:
- 1. D
  - 2. C
  - 3. B
  - 4. A
- 6-25. Sudden cooling of overheated tubes:
- 1. D
  - 2. C
  - 3. B
  - 4. A
- 6-26. Improper fabrication of tubes is most likely to result in which of the following conditions?
- 1. Upset tubes
  - 2. Swaging
  - 3. Wall lamination
  - 4. Mechanical fatigue cracks
- 6-27. The basic reason for tube failure caused by fireside and waterside deposits is that the deposits result in which of the following conditions?
- 1. Oxygen pitting
  - 2. Tube wall lamination
  - 3. Localized overheating
  - 4. Tube abrasion
- 6-28. Abundant water combining with soot on firesides of tubes may result in the formation of what substance?
- 1. Slag
  - 2. Iron oxide
  - 3. Ferrous sulfate
  - 4. Saltlike granules
- 6-29. Steam drum protection plates are most likely to be damaged when what condition exists?
- 1. Gas passages are clogged
  - 2. Superheater is overfired
  - 3. Steam pressure is formed too fast
  - 4. Brickwork adjacent to the superheater headers is damaged
- 6-30. When testing the functions of automatically or manually controlled devices that interfere with steam distribution, you should ensure that which of the following main distribution valves is/are closed?
- 1. Gas only
  - 2. Gas and water
  - 3. Main steam
  - 4. Water and steam
- 6-31. When CO<sub>2</sub> or O<sub>2</sub> measuring devices are not available, you can use which of the following indications as a guide for checking the air-fuel ratio on a small boiler?
- 1. Fuel consumption
  - 2. Draft gauge
  - 3. Feedwater consumption
  - 4. Appearance of the fire

- 6-32. On a fully automatic boiler, you can check the flame failure and combustion air failure devices in which of the following ways?
1. By simulating a flame failure manually
  2. By observing the complete programmed sequence cycle
  3. By simulating a low-water condition
  4. By bypassing the draft controller
- 6-33. With respect to steam and water piping, you should look for which of the following conditions during an inspection?
1. Excessive expansion and contraction
  2. Undue vibration in piping connections to the boiler
  3. Leaking water column connections
  4. Each of the above
- 6-34. What is the best method for determining proper operation of high- and low-water alarms?
1. Open the surface blowdown valve momentarily
  2. Blow down the water column with steam on the boiler only
  3. Observe the action of the water during blowdown of the gauge glass only
  4. Blow down the water column with steam on the boiler and observe the action of the water during blowdown of the gauge glass
- 6-35. Of the following steps, which one should you take to test the operation of a float-activated low-water fuel cutoff device?
1. Drain the float bowl to the low-water level
  2. Close the fuel oil solenoid valve
  3. Blow down the steam drum
  4. Disconnect the low-water control circuitry
- 6-36. Normally, a temperature controlled low-water fuel cutoff device responds to an increase in temperature inside the boiler under which of the following circumstances?
1. Stack temperature is excessively high
  2. Water drops to a predetermined level
  3. Steam pressure is no more than 2 percent above normal
  4. Water temperature rises uniformly to the steaming level
- 6-37. When testing blowoff valves, you should open the valves for a few seconds to check for which of the following conditions?
1. Back pressure
  2. Valve wear only
  3. Restrictions only
  4. Valve wear and restrictions
- 6-38. To check the blowoff setting of safety valves and water-pressure relief valves, you should perform which, if any, of the following actions?
1. Raise boiler pressure slowly to the blowoff pressure
  2. Manually raise the valve
  3. Gag all safety and relief valves
  4. None of the above
- 6-39. A properly functioning single safety valve on a steam boiler that has a maximum allowable working pressure of 150 psi should reseal tightly at what minimum pressure?
1. 144 psi
  2. 124 psi
  3. 104 psi
  4. 84 psi
- 6-40. What should be the individual settings of two pressure relief valves on a hot-water boiler having a maximum allowable working pressure of 100 psi?
1. One at 125 psi, the other at 100 psi maximum
  2. Both at 110 psi
  3. One at 150 psi, the other at 110 psi
  4. One at 120 psi maximum, the other at 100 psi
- 6-41. A properly set single, pressure relief valve on a boiler with a maximum allowable working pressure of 80 psi should reseal tightly with a blowdown of what maximum pressure?
1. 15 psi
  2. 20 psi
  3. 25 psi
  4. 30 psi

6-42. Under certain conditions, which of the following factors can be used to determine safety valve capacity?

1. Operating pressure
2. Maximum steam generating capacity only
3. Maximum evaporative capacity only
4. Maximum steam generating capacity or maximum evaporative capacity

6-43. Venting should be held to a minimum to preclude what condition in the feedwater?

1. Deaerator venting
2. Hydrogen entrainment
3. Oxygen entrainment
4. Oxygen venting

6-44. As a boiler plant supervisor, you should be able to identify which of the following indications of trouble?

1. Strange noises
2. Unusual vibrations
3. Abnormal temperatures
4. Each of the above

LOG ENTRIES

- A. Steam Pressure
- B. Steam flow
- C. Feedwater pump
- D. Feedwater pressure

Figure 6D

IN ANSWERING QUESTIONS 6-45 THROUGH 6-47, REFER TO FIGURE 6D.

6-45. Actual output recorded in pounds per hour to obtain steam flow:

1. A
2. B
3. C
4. D

6-46. Proper deaerating temperature being maintained in the heater:

1. A
2. B
3. C
4. D

6-47. Effectiveness of the boiler feed pumps:

1. D
2. C
3. B
4. A

6-48. With other conditions constant, a decrease in what type of draft indicates leaking baffles?

1. Last pass
2. Mechanical
3. Forced
4. Furnace

6-49. What reading(s) is/are an indication that heat is being lost by way of the stack?

1. Percentage of CO<sub>2</sub> flue gas
2. Flue-gas temperature
3. Soot-blown time and blowdown
4. Hot-water supply temperature and blowdown

6-50. What type(s) of fuel consumption is/are determined by use of a measuring stick?

1. Gallons of oil
2. Pounds of coal only
3. Cubic feet of gas only
4. Pounds of coal and cubic feet of gas

6-51. The hot-water supply temperature should be recorded because insufficiently heated water can cause which of the following conditions?

1. Abnormal soot deposits
2. Hammer knock in a steaming boiler
3. Deposits or scaling in a boiler
4. Large amounts of chemicals to accumulate in the feedwater

6-52. In what log column should you record the date a boiler was drained and washed?

1. Remarks
2. Makeup water
3. Water pressure
4. Soot-blown time and blowdown

- 6-53. An operator coming on duty should perform an operational inspection for which of the following reasons?
1. To ensure the boiler water level is correct
  2. To ensure the system is operating normally
  3. To ensure sufficient fuel is available
  4. To ensure the boiler room is clean
- 6-54. The technical library should contain current Navy publications pertaining to your boiler plant and which, if any, of the following manuals?
1. Specific plant manufacturer's manual
  2. General plant manufacturer's manual
  3. Army boiler operation and repair technical manuals
  4. None of the above
- 6-55. What term is commonly used to describe the universal solvent?
1. Oxygen
  2. Water
  3. Sodium phosphate
  4. Caustic soda
- 6-56. A glass of tap water at 77°F contains a total of how many ppm of oxygen?
1. 7.5
  2. 7.8
  3. 8.2
  4. 9.0
- 6-57. To prevent corrosion damage to metal in the interior of the boiler, you should perform which of the following actions?
1. Paint the interior metal surfaces
  2. Chemically treat the feedwater only
  3. Chemically treat the boiler water only
  4. Chemically treat the feedwater and the boiler water
- 6-58. What is the term used for deposits on tubes and other internal surfaces caused by calcium salts, magnesium salts, and other insoluble materials?
1. Deposits
  2. Scales
  3. Crystals
  4. Solids
- 6-59. Chemical treatment of boiler water causes scale-forming substances in what form?
1. Scale deposits
  2. Fluid sludge
  3. Carbonate of sulfate
  4. Caustic soda
- 6-60. When required to treat boiler water containing calcium, you should use what chemical?
1. Sodium phosphate
  2. Calcium phosphate
  3. Calcium silicate
  4. Sodium silicate
- 6-61. What sludge conditioner is the only dispersant approved by NAVFAC?
1. Magnesium silicate
  2. Calcium sulfate
  3. Sodium phosphate
  4. Quebracho tannin
- 6-62. A small amount of seawater in the feedwater causes which, if any, of the following conditions inside a boiler?
1. Steam carry-over
  2. Baked sludge
  3. Heavy sludge
  4. None of the above
- 6-63. What chemical should you add to boiler water to raise the pH value?
1. Iron oxide
  2. Caustic soda
  3. Sodium sulfite
  4. Tannin
- 6-64. What chemical is often referred to as an oxygen scavenger?
1. Iron oxide
  2. Caustic soda
  3. Sodium sulfite
  4. Tannin
- 6-65. Feedwater or makeup water tanks should be maintained within what temperature range?
1. 125°F to 135°F
  2. 140°F to 160°F
  3. 165°F to 175°F
  4. 180°F to 200°F

6-66. The production of froth or unbroken bubbles on the surface of the boiler water is known by what term?

1. Foaming
2. Steam production
3. Alkalinity
4. Scum

6-67. What condition(s) in a boiler make(s) it difficult, or quite often impossible, to read the true level of boiler water on the gauge glass?

1. Foaming only
2. Priming only
3. Foaming or priming
4. Bumping or priming

6-68. What two types of solids are present in most boiler water?

1. Dissolved and gloating
2. Suspended and floating
3. Dissolved and scale-forming
4. Suspended and dissolved

6-69. The continuous blowdown should be regulated to maintain what ppm of TDS in a steaming boiler?

1. 2,000 to 3,000
2. 3,000 to 4,000
3. 4,000 to 5,000
4. 5,000 to 6,000

6-70. One boiler horsepower produces a total of how many pounds of steam per hour?

1. 3.450
2. 34.50
3. 345.0
4. 3,450

6-71. Once the boiler has stabilized and treatment test results remain reasonably balanced, you should conduct testing at what intervals, in hours?

1. 1
2. 2
3. 3
4. 4

## ASSIGNMENT 7

Textbook Assignment: "Boilers," "Duct and Ventilation Systems," and "Air Conditioning and Refrigeration."  
Pages 12-38 through 14-26.

---

- 7-1. What person is the most important member of a boiler maintenance team?
1. The supervisor
  2. The welder
  3. The laboratory technician
  4. The operator
- 7-2. Any unusual temperature change the operator cannot correct should be reported to what individual?
1. Plant supervisor
  2. Watch chief
  3. Relief operator
  4. Maintenance supervisor
- 7-3. What is the main purpose for conducting preventive maintenance inspections?
1. To keep the equipment in good operating condition
  2. To anticipate and prevent equipment breakdown
  3. To repair broken equipment
  4. To keep an accurate maintenance record of all equipment
- 7-4. Refer to table 12-4. What draft reading is recommended in an oil burner firebox?
1. 1.0 inch
  2. 2.0 inches
  3. 0.01 inch
  4. 0.02 inch
- 7-5. When soot combines with moisture, what is the result?
1. Slag
  2. Sulfur dioxide
  3. Sulfuric acid
  4. Hydrogen sulfide
- 7-6. When left untended, soot corrosion on boiler metals causes which of the following problems?
1. Extensive deterioration
  2. High fuel cost
  3. High operating cost
  4. Dirty steam
- 7-7. Soot and other deposits left on boiler brickwork lower the melting point of which of the following components?
1. Boiler tubes
  2. Headers
  3. Refractories
  4. Burners
- 7-8. Failure to keep boiler watersides clean can result in which of the following conditions?
1. Dirty steam
  2. Overheating
  3. Carry-over
  4. Low temperature
- 7-9. What condition often signals the need for waterside and fireside cleaning?
1. Lowering of stack gas temperature
  2. Lowering of steam temperature
  3. Rise in stack gas temperature
  4. Rise in steam temperature
- 7-10. When preparing to work on watersides, what must you do concerning tools and equipment?
1. Sparkproof the metal tools
  2. Clean and wipe each tool dry
  3. Inventory and tag the tools
  4. Inventory the tools and prepare an in/out sheet
- 7-11. What special type of extension light, if any, is authorized inside a boiler?
1. Explosionproof
  2. Dustproof
  3. Watertight glove
  4. None



- 7-12. When work on the watersides of a boiler is being performed, a person should be stationed outside the boiler for what sole purpose?
1. To act as tender only
  2. To assist workers in the boiler only
  3. To act as tender and to assist workers in the boiler
  4. To perform first aid if necessary
- 7-13. What two methods can be used to boil out the watersides of a boiler?
1. Sodium metasilicate pentahydrate and trisodium silicate
  2. Sodium pentahydrate and sulfuric acid
  3. Sodium silicate and trisodium metasilicate pentahydrate
  4. Sodium metasilicate pentahydrate and trisodium phosphate
- 7-14. In the wet lay-up method, you should add what chemical to the water?
1. Sodium sulfite
  2. Sodium hydroxide
  3. Sodium silicate
  4. Sodium electrolyte
- 7-15. In the wet lay-up method, 0.03-0.06 pounds of sodium sulfite should be added per how many gallons of water?
1. 30
  2. 50
  3. 100
  4. 1,000
- 7-16. At what interval should water in an idle boiler be sampled and analyzed?
1. Daily
  2. Weekly
  3. Monthly
  4. Quarterly
- 7-17. In the dry lay-up method, a minimum of how many pounds of quicklime should be used as a drying agent per 100 boiler horsepower?
1. 5
  2. 10
  3. 20
  4. 40
- 7-18. A high-pressure or high-velocity ductwork system has a fan that operates within what static-pressure range?
1. 1 inch to 5 inches WC
  2. 2 inches to 6 inches WC
  3. 3 inches to 7 inches WC
  4. 4 inches to 8 inches WC
- 7-19. Duct velocities greater than how many feet per minute (fpm) are normally unwarranted?
1. 2,000
  2. 3,000
  3. 4,000
  4. 6,000
- 7-20. In a low-velocity system, the duct velocity is normally less than how many feet per minute?
1. 2,000
  2. 1,500
  3. 1,000
  4. 500
- 7-21. What type of duct system is no longer legal?
1. Fiber glass
  2. Asbestos
  3. Sheet metal
  4. Aluminum
- 7-22. When possible, you should use what shape of duct system ?
1. Square
  2. Rectangular
  3. Round
  4. Trapezoidal
- 7-23. What is/are the primary disadvantage(s) of a double-duct system?
1. Unstable air quantities
  2. High air velocities only
  3. Unstable duct pressures only
  4. High air velocities and unstable duct pressures
- 7-24. The type of material used for duct lining and covering must have what characteristic?
1. It must be nonbacteriological
  2. It must be noncombustible
  3. It must be sound absorbent
  4. It must be inflexible

7-25. The power required by the fan for delivering air at a given quantity increases rapidly according to what change, if any, in duct size?

1. An increase only
2. A decrease only
3. An increase or a decrease
4. None

7-26. Rectangular fiber-glass ducts 24 inches or less in diameter must be supported every how many feet?

1. 10
2. 8
3. 6
4. 4

7-27. What type of joint is used to absorb expansion and contraction in a duct system?

1. Accordion
2. Bellows
3. Shiplap
4. Fabric

7-28. When computing duct size, you should first perform what calculation?

1. Air pressure
2. Air volume
3. Air velocity
4. Air movement

7-29. You can gain efficiency by installing what type of elbow in a duct system?

1. Long, sweeping
2. Short, 90 degree
3. Unidirectional
4. S curve

7-30. Short, 90-degree elbows can be used effectively in which of the following locations within an air duct system?

1. Before registers only
2. Before diffusers only
3. Before grilles only
4. Before registers, diffusers, and grilles

7-31. When designing a duct system, you should use what publication as a source of technical information?

1. Mechanical Engineering Manual
2. Duct Design and Fabrication
3. Construction Engineering Handbook
4. ASHRAE Handbook of Fundamentals

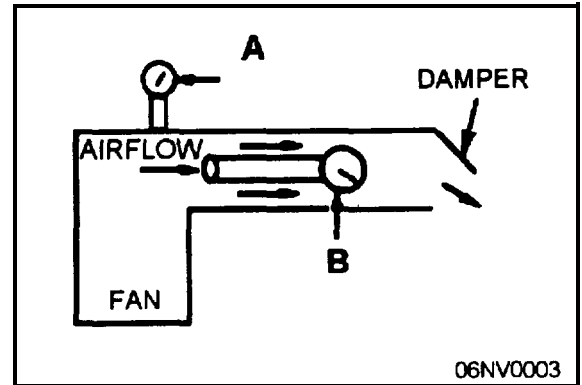


Figure 7A

IN ANSWERING QUESTIONS 7-32 AND 7-33, REFER TO FIGURE 7A.

7-32. The total pressure of the duct system is equal to the pressure reading of what gauge(s)?

1. A only
2. B only
3. B plus A
4. B minus A

7-33. The velocity pressure of the duct system is equal to the pressure reading of what gauge(s)?

1. A plus B
2. A only
3. A minus B
4. B minus A

7-34. A newly installed duct system is balanced in what manner?

1. By adjusting the speed of the fan
2. By drilling small holes in branch holes
3. By adjusting air outlets to the design rate of flow
4. By installing dampers in the main duct

- 7-35. What is the main purpose of pressure measurements after a newly installed system is balanced and operating properly?
1. To check the design of the system
  2. To provide information for required reports
  3. To provide information for future tests
  4. To ensure proper adjustment of the fan and air outlets

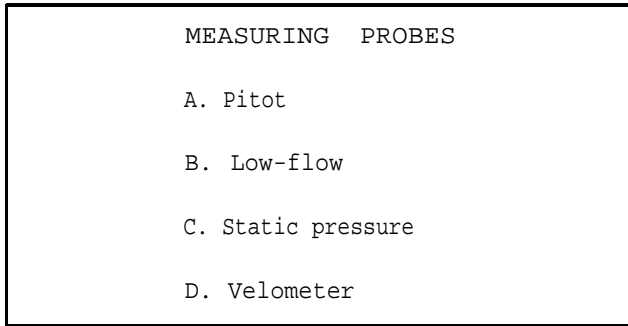


Figure 7B

IN ANSWERING QUESTIONS 7-36 THROUGH 7-38, REFER TO FIGURE 7B.

- 7-36. Measures air currents in open spaces:

1. A
2. B
3. C
4. D

- 7-37. Measures pressure drop across blowers in duct systems:

1. A
2. B
3. C
4. D

- 7-38. Measures internal air velocities in duct systems:

1. D
2. C
3. B
4. A

- 7-39. When used in conjunction with the diffuser probe, what device permits the rapid change of measuring ranges without shifting to separate jets for different velocities?

1. Manometer
2. Range selector
3. Tachometer
4. Anemometer

- 7-40. Which of the following is NOT a unit by which a manometer measures air pressure?

1. Pounds per square inch
2. Inches of mercury
3. Inches of water
4. Cubic feet per minute

- 7-41. One of the preliminary steps in air-balancing operations is to prepare a working sketch of the system. Which of the following items should be included in the sketch?

1. Duct dimensions
2. Air flow volumes and velocities
3. Air-delivery design of each outlet and type of diffuser
4. Each of the above

- 7-42. When balancing an air distribution system, you should first determine fan performance for which of the following reasons?

1. To pinpoint problems caused by blockages in the duct system
2. To ensure the fan is rotating correctly
3. To ensure that sufficient static pressure and air volume are being handled at the fan
4. To ascertain whether the air filters are clean

- 7-43. What factors influence the performance of a fan in a ventilation system?

1. Static pressure and rpm of the fan
2. Voltage and amperage of the fan motor
3. Total airflow in the ventilation system
4. Each of the above

- 7-44. What instruments are used to measure the static pressure of an operating fan?
1. Velometer and static-pressure probe
  2. Rotating vane anemometer and low-flow probe
  3. Velometer and Pitot tube
  4. Manometer and diffuser probe
- 7-45. Which of the following air distribution problems in ducts can be located quickly by measuring static pressure?
1. Leakage
  2. Blockage
  3. Slippage
  4. Each of the above
- 7-46. Velocity pressure readings should be taken to determine the total air volume of a fan from which, if any, of the following areas?
1. Fan suction
  2. Fan distribution spaces
  3. Downstream of the fan in an area with minimum turbulence
  4. None of the above
- 7-47. Velocity pressure readings should be taken at what location inside a rectangular duct?
1. Along the perimeter at equal intervals
  2. From the center of equally divided areas of the cross section
  3. Along the horizontal center line at equal intervals
  4. At any accessible location
- 7-48. When the average velocity pressure is 120 fpm and the cross-sectional measurements are 18 inches by 24 inches, what is the total airflow, in cfm, within the duct?
1. 120
  2. 270
  3. 320
  4. 360
- 7-49. The measured total air flow, in cfm, should exceed the design cfm by approximately 10 percent for which of the following reasons?
1. To allow for slippage
  2. To ensure maximum fan speed
  3. To allow for leakage
  4. Each of the above
- 7-50. At what location, in respect to the duct configuration, should the final balancing procedure be started?
1. Downstream of the main air return
  2. In the immediate area of the fan discharge
  3. At the last outlet on the farthest branch from the fan discharge
  4. In the largest spaces served by the duct
- 7-51. During the final balancing procedure, an air outlet that should be discharging 90 cfm is found to be discharging 125 cfm. Which of the following actions should you take?
1. Leave the damper open and proceed to the next outlet
  2. Adjust the damper until the output drops to 90 cfm
  3. Decrease the fan speed
  4. Restrict the flow of return air
- 7-52. What term is commonly used to identify fresh air leakage into a building or room?
1. Infiltration
  2. Exfiltration
  3. Ventilation
  4. Defiltration
- 7-53. A minimum amount of how much fresh air is necessary to provide sufficient oxygen and to remove carbon dioxide for each person in a typical office space?
1. 8 cfm
  2. 2 cfm
  3. 6 cfm
  4. 4 cfm

7-54. A total of how many changes of air per hour is required for a conditioned space in a residence during the heating season?

1. One
2. Two
3. Three
4. Four

7-55. A sleeping person gives off approximately how many Btu per hour of heat?

1. 50
2. 100
3. 150
4. 200

7-56. When installing a natural ventilation system, you should consider location and what other factor regarding ventilation openings?

1. Wind
2. Control
3. Humidity
4. Temperature

7-57. You should use mechanical ventilation equipment under which, if any, of the following circumstances?

1. The outside air is high in humidity
2. The outside air has a high ambient temperature
3. The outside air cannot be supplied continually by natural forces
4. None of the above

7-58. When areas to be air-conditioned are in close proximity to each other, you should use what type of air-conditioning system?

1. Chilled water only
2. Hot and chilled water
3. Forced air
4. Natural draft

7-59. What type of air-conditioning system is recommended for use in a hospital?

1. Chilled water only
2. Hot and chilled water
3. Forced air
4. Natural draft

7-60. In heat load calculations, what factor denotes heat leakage?

1. H
2. K
3. P
4. R

7-61. In heat load calculations, what factor denotes insulation values?

1. R
2. P
3. K
4. H

7-62. When working on an ammonia-absorption refrigeration system, you need what type of manifold gauges?

1. Brass
2. Copper
3. Steel
4. Bronze

7-63. An expendable evaporator system works within what temperature range?

1. 32°F to 0°F
2. 15°F to -5°F
3. 10°F to -10°F
4. -20°F to 60°F

7-64. When you want to preserve the freshness of fruits and vegetables, you should use what type of evaporator system?

1. Expendable
2. Eutectic
3. Spray
4. Thermoelectric

7-65. What type of refrigeration system has no moving parts?

1. Expendable
2. Eutectic
3. Spray
4. Thermoelectric

7-66. What maximum temperature can be maintained in a cascade refrigeration system?

1. - 50°F
2. -100°F
3. -150°F
4. -250°F

7-67. What maximum temperature can be attained in a three-stage compound system?

1. -80°F
2. -135°F
3. -150°F
4. -250°F

7-68. Refer to figure 14-22B. The pressure at P1 is 7 pounds, P2 is 4 pounds, and P3 is 21 pounds. The valve is in what position?

1. Equilibrium
2. Closed
3. Open
4. None of the above

7-69. An external equilizer line is required when what pressure drop exists across an evaporator coil?

1. 1 pound
2. 5 pounds
3. 3 pounds
4. 7 pounds

7-70. When adjusting a thermal expansion valve, you must make how many turns of the valve stem at each interval?

1. One
2. Two
3. Three
4. Four

7-71. Of the following considerations, which one is most important when you are mounting a condenser on a roof?

1. The roof load strength
2. The noise level
3. The availability of water
4. The availability of electricity

7-72. What types of metal are used in a bi-metal thermostat?

1. Tin and antimony
2. Tin and steel
3. Copper and steel
4. Brass and invar

7-73. What type of thermostat uses 115 volts?

1. Line voltage
2. Low voltage
3. Millivoltage
4. High voltage

7-74. What is the most commonly used metering device?

1. The AEX
2. The capillary tube
3. The TEV
4. The low-side float

7-75. The additional starting torque of a capacitor-start, induction-run motor over that of a split-phase motor is provided by a

1. run capacitor in parallel with the start winding
2. start capacitor in series with the run winding
3. run capacitor in parallel with the run winding
4. start capacitor in series with the start winding

## ASSIGNMENT 8

Textbook Assignment: "Air Conditioning and Refrigeration," "Solar Energy," and "Environmental Pollution Control."  
Pages 14-17 through 16-3.

---

- 8-1. Which of the following types of motors should be used for a 5-horsepower, high-starting torque requirement?
1. Split-phase
  2. Capacitor-start, capacitor-run
  3. Permanent split-phase
  4. Capacitor-start, induction-run
- 8-2. The permanent split-phase motor circuit differs from a split-phase in which, if any, of the following ways?
1. It requires a start capacitor in series with the start winding
  2. It uses a run capacitor in series with the start winding
  3. It requires a start relay
  4. None of the above
- 8-3. Start windings are used in single-phase motors designed for use with hermetic refrigeration for which of the following reasons?
1. The motors start under load conditions
  2. The compressors are operated at two speeds
  3. The motors start under no-load conditions
  4. The start winding is a standby winding
- 8-4. The opposition to the flow of alternating current caused by the inductance and capacitance in the run winding is a result of
1. low reactance
  2. high reactance
  3. low resistance
  4. high resistance
- 8-5. When using an ohmmeter to identify motor terminals, you should perform what action first?
1. Remove the wires connected to the terminal
  2. Mark the wires for later identification
  3. Remove power to the motor circuit
  4. Disconnect the ground
- IN ANSWERING QUESTIONS 8-6 THROUGH 8-8, REFER TO FIGURE 14-30. ASSUME THE METER IS FUNCTIONING PROPERLY.
- 8-6. The R to S test indicates that the remaining terminal is the common terminal because the resistance of
1. the run winding is high
  2. both windings in parallel are high
  3. the start winding is low
  4. both windings in series are high
- 8-7. The C to S test indicates that the remaining terminal is the run terminal for which, if any, of the following reasons?
1. It has the greatest resistance
  2. It has a much lower resistance
  3. It has the same resistance
  4. It has medium resistance
- 8-8. If, during either the R to S or the C to S test, the ohmmeter needle fails to move, you should check for what problem?
1. An open start relay
  2. A defective winding
  3. An open run capacitor
  4. A shorted start capacitor
- 8-9. Which of the following components is considered a load?
1. Thermostat
  2. High-pressure switch
  3. Set of contacts
  4. Coil of a contactor
- 8-10. An ohmmeter shows a resistance of infinity between the R and C motor terminals during a continuity test. Which of the following faults is indicated?
1. A grounded run winding
  2. An open start winding
  3. A shorted start winding
  4. An open run winding

- 8-11. Assume that you are using a test lamp to check the continuity between the C and S terminals of a motor. What fault is indicated when the light fails to come on?
1. An open in the start winding
  2. A short in the start winding
  3. An open in the run winding
  4. A short in the run winding
- 8-12. Which of the following conditions exists in the case of a shorted winding?
1. A wire is burned in half
  2. The winding has a high resistance
  3. A loop of copper wire is in contact with another wire
  4. A wire is touching the hermetic shell
- 8-13. An ohmmeter indicates a start winding resistance of 4 ohms for a motor that has a run winding resistance of 2.5 ohms. The low resistance of the motor start winding is most likely due to what fault?
1. An open
  2. A short
  3. A grounded start capacitor
  4. A burned current relay
- 8-14. Refer to figure 14-33. What fault is indicated by continuity between one of the motor terminals and the shell?
1. A short
  2. An open
  3. A ground
  4. An overload
- 8-15. Which of the following devices can be used to test a hermetic motor for grounds?
1. Ohmmeter
  2. Test lamp
  3. Megger
  4. Each of the above
- 8-16. Refer to figure 14-26. At what time should the contact points be in the open position?
1. The off-cycle only
  2. The start winding is de-energized
  3. The motor reaches about three-fourths rated speed
  4. Each of the above
- 8-17. Unlike the current relay that responds to starting current in the motor circuit, the voltage relay responds to which, if any, of the following conditions?
1. Current flow through the run winding only
  2. Voltage induced in the start winding
  3. Leveling effect of the run capacitor
  4. None of the above
- 8-18. When the circuit draws excessive current, which of the following starting relays is capable of de-energizing the running winding circuit?
1. Hot wire
  2. Voltage
  3. Current
  4. Each of the above
- 8-19. Refer to figure 14-38. When an overload protector is open, the opening action is the direct result of what condition?
1. Voltage
  2. Heat
  3. Current
  4. Capacitance
- 8-20. What device, if any, is used in the starting circuit of an induction motor to provide leading current through one winding?
1. Overload protector
  2. Starting capacitor
  3. Running capacitor
  4. None
- 8-21. Assume that you are testing the contacts of a voltage-type starting relay with an ohmmeter. The normally closed contacts are working properly in which of the following circumstances?
1. Contacts lack continuity
  2. Negligible resistance exists in the relay coil
  3. Current is not flowing through the contacts
  4. Continuity exists through the contacts



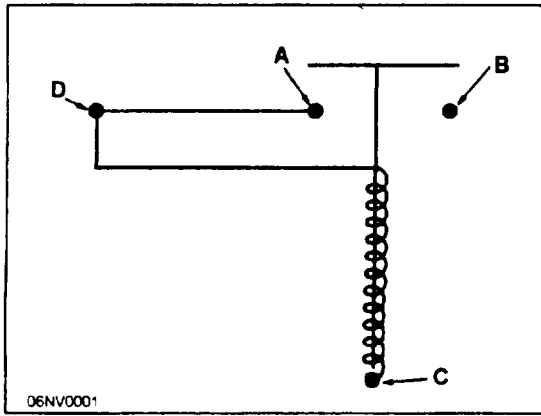


Figure 8A

IN ANSWERING QUESTIONS 8-22 THROUGH 8-24, REFER TO FIGURE 8A.

8-22. At what points should an ohmmeter be connected to test the relay coil?

1. A and B
2. B and C
3. C and D
4. D and B

8-23. At what points should an ohmmeter be connected to test the relay contacts?

1. A and B
2. B and D
3. C and B
4. D and C

8-24. Which of the following ohmmeter test results indicates the contacts of a current relay are satisfactory?

1. Continuity through points A and B
2. Lack of continuity through points A and C only
3. Lack of continuity through points A and B only
4. Lack of continuity through points A, B, and C

8-25. Refer to figure 14-40. Assuming the test is accomplished, which of the following meter readings indicates an open coil?

1. 110 volts
2. 2 ohms
3. Infinity
4. 4 amps

8-26. When a starting relay fails, you can start the compressor motor by bypassing the relay manually using which of the following devices?

1. A test lamp and cable
2. An ohmmeter with four lead wires
3. A test line cord, fuse, and capacitor
4. A jumper placed across terminals C and R and a test lamp

8-27. Which, if any, of the following circuit conditions indicates an internal current temperature overload protector is open in a hermetic motor?

1. Continuity across C and S, C and R, and S and R
2. Open across C and S, C and R, and continuity across S and R
3. Continuity across C and R, and an open across S and R and C and S
4. None of the above

8-28. You are testing a capacitor with an ohmmeter. What general reading on the meter indicates the capacitor is good?

1. Zero resistance and then climbs to high resistance
2. Low resistance
3. Medium resistance

8-29. Which of the following electrical components is NOT part of a load circuit shown in a hermetic system schematic wiring diagram?

1. Compressor motor
2. Start capacitor
3. Thermostat
4. Fan motor

- 8-30. If you are reading voltage across a set of contacts, the contacts are
1. burned
  2. open
  3. shorted
  4. closed
- 8-31. Energy from the sun is received by the earth in what form?
1. Conduction
  2. Radiation
  3. Convection
  4. Diffusion
- 8-32. What term describes the amount of solar energy per unit area per unit of time striking the earth's surface?
1. Solar isolation
  2. Solar radiation
  3. Solar insolation
  4. Solar collection
- 8-33. Which of the following expressions describes the solar constant?
1. 418 Btu/hr-ft<sup>2</sup>
  2. 2,453 watts/m
  3. 1.940 Langleys/min
  4. Each of the above
- 8-34. What percentage of solar energy is absorbed by the atmosphere?
1. 10% to 20%
  2. 20% to 30%
  3. 30% to 40%
  4. 40% to 50%
- 8-35. What is the average solar intensity in Btu per square foot per day on the ground?
1. 1,200
  2. 1,300
  3. 1,400
  4. 1,500
- 8-36. What is the best and most frequent choice as to the orientation of a solar collector?
1. Grid south
  2. True south
  3. Slightly east of south
  4. Slightly west of south
- 8-37. During what hours of the day does most of the useful energy collection take place?
1. 0700 to 1700
  2. 0800 to 1600
  3. 0900 to 1500
  4. 0900 to 1700
- 8-38. What are the two basic types of solar collectors?
1. Direct and indirect
  2. Oriented and disoriented
  3. Parallel and horizontal
  4. Liquid and air
- 8-39. The absorber plate absorbs solar energy and converts it to which of the following types of energy?
1. Heat
  2. Radiant
  3. Thermal
  4. Electrical
- 8-40. What type of collector is most suitable for low-temperature applications?
1. Air
  2. Liquid
  3. Flat plate
  4. Convex plate
- 8-41. Some collectors are made with a black coating for which of the following reasons?
1. To emit low-frequency infrared radiation
  2. To emit low-frequency ultraviolet radiation
  3. To emit high-frequency incoming solar radiation
  4. To absorb high-frequency incoming solar radiation
- 8-42. What is the most commonly used substance for collector covers?
1. Film
  2. Glass
  3. Plastic
  4. Transparent tape

- 8-43. What is the percentage of transmissivity for standard plate glass?
1. 86%
  2. 76%
  3. 66%
  4. 56%
- 8-44. What is the cheapest and most obtainable collector fluid?
1. Air
  2. Water only
  3. Alcohol only
  4. Water and alcohol
- 8-45. Air is not preferred as the collector fluid in domestic solar water heating for which of the following reasons?
1. It freezes
  2. It corrodes
  3. It has a high density
  4. It has a low-heat capacity
- 8-46. What freeze protection method has a pump to circulate the water through the collectors until the freezing temperatures are over?
1. Drain-up method
  2. Drain-down method
  3. Recirculating method
  4. Supercirculating method
- 8-47. What are the types of heat transfer fluids?
1. Silicones and hydrocarbon oils
  2. Nonaqueous and aqueous
  3. Inhibited distilled water and silicones
  4. Inhibited glycol/water mixtures and hydrocarbon oils
- 8-48. What is the flash point of silicone fluids?
1. 450°F
  2. 400°F
  3. 350°F
  4. 300°F
- 8-49. Silicone fluids are limited to systems with what maximum temperature?
1. 350°F
  2. 400°F
  3. 450°F
  4. 500°F
- 8-50. What substance is added to water to make it a useful collector fluid?
1. Ethylene glycol
  2. Methylene glycol
  3. Silicone glycol
  4. Aluminum glycol
- 8-51. A 50-50 water and glycol mixture will protect against freezing down to about what temperature?
1. -10°F
  2. -20°F
  3. -30°F
  4. -40°F
- 8-52. Which of the following types of collectors uses a vacuum between the absorber and the glass outer tube to reduce convection and conduction heat losses?
1. Evacuated tube
  2. Flat plate
  3. Concentrating
  4. Intensifying
- 8-53. Which of the following types of collectors intercepts direct radiation over a large area and focuses it onto a small absorber area?
1. Evacuated tube
  2. Flat plate
  3. Concentrating
  4. Intensifying
- 8-54. Which of the following collectors collects energy by reflecting direct solar radiation off a large curved mirror and onto a small absorber tube?
1. Linear-trough fresnel lens
  2. Parabolic trough
  3. Compound parabolic mirror
  4. Simple parabolic mirror
- 8-55. Which of the following collectors focuses incoming rays onto a small absorber plate or tube through which the heat transfer liquid is circulated?
1. Linear-trough fresnel lens
  2. Parabolic trough
  3. Compound parabolic mirror
  4. Parabolic fresnel lens

- 8-56. what amount of water storage is needed per square foot of collector?
1. 10 pounds
  2. 15 pounds
  3. 20 pounds
  4. 25 pounds
- 8-57. In air collector systems, latent heat is stored in a material as it changes phase from a
1. liquid to a gas
  2. gas to a liquid
  3. liquid to a solid
  4. solid to a liquid
- 8-58. More expensive, specially fabricated fiber glass or plastic tanks can withstand heat up to what temperature?
1. 450°F
  2. 350°F
  3. 250°F
  4. 150°F
- 8-59. For typical family residences, each person accounts for approximately how many gallons of hot water per day?
1. 10
  2. 20
  3. 30
  4. 40
- 8-60. What is the primary advantage of a thermosiphon system of water storage?
1. It uses a lightweight tank
  2. It needs no pump or controller
  3. It connects directly to the potable water supply
  4. It can use a heat exchanger
- 8-61. What factors contribute to the reduction of heat loss from a rock bed?
1. The density and proclivity
  2. The intensity and range
  3. The conduction and convection is considerable
  4. The conduction and convection is small
- 8-62. What type of heat storage is well suited for warehouses and factories that have mainly daytime operations?
1. No-storage air heating
  2. Rock bed
  3. Air type of space heating
  4. Thermosiphon
- 8-63. Most baseboard heaters require approximately what temperature?
1. 150°F
  2. 160°F
  3. 170°F
  4. 180°F
- 8-64. During the winter, a liquid type of solar system is rarely operated at delivery temperatures above
1. 130°F
  2. 140°F
  3. 150°F
  4. 160°F
- 8-65. The water-to-air heat pump can effectively use heat from solar storage at what temperature?
1. 25°F
  2. 35°F
  3. 45°F
  4. 55°F
- 8-66. Midday collection temperatures are usually within what range?
1. 120°F to 150°F
  2. 130°F to 170°F
  3. 140°F to 160°F
  4. 150°F to 180°F
- 8-67. An oil slick on a water surface blocks the flow of what element from the atmosphere into the water?
1. Hydrogen
  2. Ozone
  3. Oxygen
  4. Carbon dioxide

8-68. On a naval base, what department normally disposes of oil waste residues?

1. PWD
2. DPDO
3. NPDO
4. DDPO

8-69. In what type of approved container should you store oil-soaked absorbent materials for proper disposal?

1. DPDO
2. NPDO
3. APE
4. EPA

8-70. After observing contaminated water from a vehicle washrack polluting the water, you should immediately contact what person?

1. Washrack operator
2. Washrack supervisor
3. Company commander
4. Assistant company commander

8-71. When unburned hydrocarbons and various other fuel components combine chemically, which of the following by-products is normally formed?

1. Carbon monoxide
2. Carbon dioxide
3. Sulfur dioxide
4. Lead sulfite

8-72. What three terms are associated with asbestos dust particle size?

1. Centimeter, millimeter, micron
2. Millimeter, micron, angstrom
3. Centimeter, micron, manometer
4. Micron, nanometer, angstrom

8-73. Air must be scrubbed with a special air filtration machine to remove what size of asbestos dust particles?

1. Millimeter
2. Micron
3. Angstrom
4. Nanometer

8-74. When involved in an asbestos removal project, you should obtain which of the following instructions for guidance?

1. DPDOINST 5100.24
2. OPNAVINST 5100.23
3. OPNAVINST 5110.23
4. OPNAVINST 5200.23

COURSE COMPLETION/DISENROLLMENT FORM  
(Refer to instructions in front of course)

PLEASE PRINT CLEARLY

|                         |       |
|-------------------------|-------|
| UTILITIESMAN (ADVANCED) | 82534 |
|-------------------------|-------|

NONRESIDENT TRAINING COURSE (NRTC)

NAVEDTRA NUMBER

|  |  |
|--|--|
|  |  |
|--|--|

NAME, RANK, RATE, CIVILIAN

SSN

IF YOUR COURSE WAS ADMINISTERED BY NETPMSA, YOU MUST SUBMIT THIS FORM TO THE ADDRESS BELOW. IF YOUR COURSE WAS ADMINISTERED BY AN ACTIVE DUTY COMMAND OR NAVAL RESERVE CENTER, DO NOT SUBMIT THIS FORM TO NETPMSA.

☐ COURSE COMPLETION (Date \_\_\_\_\_)

YOU SHOULD RETAIN THE TRAINING MANUAL AND THE ASSIGNMENT BOOKLET IF THEY ARE NOT CLASSIFIED. If CLASSIFIED, submit the material to your command for proper disposition of CLASSIFIED material. A letter of satisfactory completion will be issued to you after your last assignment is received and processed. This form should be included when you send in the last assignment. If the training manual and NRTC courses are designated with distribution statements B, C, D, E, F, or X, and you decide to dispose of the material, you must destroy the material to prevent disclosure of contents or reconstruction of the document.

☐ DISENROLLMENT (Date \_\_\_\_\_)  
(Did not complete the course)

In the event of disenrollment, submit this form to the address below with any unused ADP answer sheets. You need not return any other course material. If the course material is CLASSIFIED, you must submit the material to your command for proper disposition of CLASSIFIED material. If the training manual and NRTC courses are designated with distribution statements B, C, D, E, F, or X, and you decide to dispose of the material, you must destroy the material to prevent disclosure of contents or reconstruction of the document.

☐ OTHER REASON (Specify) :

PRIVACY ACT STATEMENT

Under authority of Title 5, USC 301, information regarding your military status is requested to assist in processing your comments and prepare a reply. This information will not be divulged, without written authorization, to anyone other than those within DOD for official use in determining performance.

|  |
|--|
| COMMANDING OFFICER<br>NETPMSA CODE 036<br>6490 SAUFLEY FIELD RD<br>PENSACOLA FL 32559-5000 |
|--|



STUDENT COMMENT SHEET

THIS FORM MAY BE USED TO SUGGEST IMPROVEMENTS, REPORT COURSE ERRORS, OR TO REQUEST HELP IF YOU HAVE DIFFICULTY COMPLETING THE COURSE.

Date \_\_\_\_\_

FROM:

SSN \_\_\_\_\_

\_\_\_\_\_  
NAME (Last, first, M.I.)  
RANK, RATE, CIVILIAN

\_\_\_\_\_  
STREET ADDRESS, APT #

\_\_\_\_\_  
ZIP CODE \_\_\_\_\_

\_\_\_\_\_  
CITY, STATE

To: COMMANDING OFFICER  
NETPMSA CODE 0314  
6490 SAUFLEY FIELD RD  
PENSACOLA FL 32509-5237

Subj: NRTC UTILITIESMAN (ADVANCED), NAVEDTRA 82534

1. The following comments are hereby submitted:

PRIVACY ACT STATEMENT

Under authority of Title 5, USC 301, information regarding your military status is requested to assist in processing your comments and prepare a reply. This information will not be divulged, without written authorization, to anyone other than those within DOD for official use in determining performance.



.....(Fold along dotted line and staple or tape).....

.....(Fold along dotted line and staple or tape).....

**DEPARTMENT OF THE NAVY**

COMMANDING OFFICER  
NETPMSA CODE 0314  
6490 SAUFLEY FIELD RD  
PENSACOLA FL 32509-5237

**OFFICIAL BUSINESS**

COMMANDING OFFICER  
NETPMSA CODE 0314  
6490 SAUFLEY FIELD RD  
PENSACOLA FL 32509-5237

PRINT OR TYPE

TITLE \_\_\_\_\_ NAVEDTRA \_\_\_\_\_

NAME \_\_\_\_\_ ADDRESS \_\_\_\_\_  
Last First Middle Street/Ship/Unit/Division, etc.

RANK/RATE \_\_\_\_\_ SOC. SEC. NO. \_\_\_\_\_ City or FPO State Zip  
DESIGNATOR \_\_\_\_\_ ASSIGNMENT NO. \_\_\_\_\_

☐ USN ☐ USNR ☐ ACTIVE ☐ INACTIVE OTHER (Specify) \_\_\_\_\_ DATE MAILED \_\_\_\_\_

SCORE

| 1  | 2                        | 3                        | 4                        |                          | 1     | 2  | 3                        | 4                        |                          | 1                        | 2     | 3  | 4                        |                          |                          |                          |       |
|----|--------------------------|--------------------------|--------------------------|--------------------------|-------|----|--------------------------|--------------------------|--------------------------|--------------------------|-------|----|--------------------------|--------------------------|--------------------------|--------------------------|-------|
| T  | F                        |                          |                          |                          | T     | F  |                          |                          |                          | T                        | F     |    |                          |                          |                          |                          |       |
| 1  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 26 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 51 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 2  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 27 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 52 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 3  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 28 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 53 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 4  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 29 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 54 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 5  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 30 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 55 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 6  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 31 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 56 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 7  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 32 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 57 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 8  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 33 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 58 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 9  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 34 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 59 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 10 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 35 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 60 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 11 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 36 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 61 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 12 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 37 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 62 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 13 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 38 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 63 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 14 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 39 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 64 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 15 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 40 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 65 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 16 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 41 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 66 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 17 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 42 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 67 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 18 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 43 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 68 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 19 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 44 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 69 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 20 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 45 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 70 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 21 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 46 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 71 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 22 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 47 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 72 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 23 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 48 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 73 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 24 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 49 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 74 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| 25 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 50 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ | 75 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |

THIS FORM MAY BE LOCALLY REPRODUCED





